DECOMPOSING THE EFFECTS OF NEGATIVE FRAMING IN LINEAR PUBLIC GOODS GAMES

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ABSTRACT. I examine two dimensions of framing in public goods games: Contributing vs. Taking and Gains vs. Losses. I find decreased cooperation under the Taking frame, but not under the Loss frame. This framing effect is stronger for men than women.

Keywords: Public goods, experiments, framing, gender differences
JEL Classification: C72, H41

1 INTRODUCTION

Cooperation in social dilemmas is of great interest to social scientists, in part because several types of public goods problems and externalities can be represented with a similar structure. Public goods may generate gains or prevent losses, and externalities may be positive or negative. In many cases, these diverse economic problems can be represented using a simple linear public goods game.

However, even strategically equivalent economic problems may differ along important framing dimensions. In this paper, I present an experiment comparing results from a linear public goods game in four framing conditions. The baseline condition involves contributing to generate gains for the group (CG). I compare this baseline with framing conditions involving contributing to prevent losses (CL), taking to prevent gains (TG), and taking to generates losses (TL). These conditions are constructed to be strategically equivalent so that differences in behavior can be attributed to framing.

A closely-related study by Andreoni (1995) compares a positive frame and a negative frame (similar to CG and TL respectively), finding lower cooperation and higher rates of free-riding in the negative frame. Andreoni concludes that the "warm glow" of benefiting others is stronger than the "cold prickle" of hurting others. This result is replicated by Park (2000). However, these studies do not distinguish between the contributing/taking dimension and the gain/loss dimension of framing, either of which might drive these results. I decompose these framing dimensions to identify their effects seperately.

Brandts and Schwieren (2009) compare framing conditions similar to the CG, TG, and TL conditions, finding a small difference between CG and TL and no difference between TG and TL. Unlike Andreoni, they vary group size, private return, and public return across rounds and give

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no feedback, making their results difficult to compare. Moreover, Sonnemans et al. (1998) suggest that framing effects may be more pronounced with repetition and feedback.

Other studies of framing in public goods games have shown mixed results. Some studies find higher cooperation in the Contributing frame than in the Taking frame (e.g. Allison and Messick, 1985; Dufwenberg et al., 2011; Khadjavi and Lange, forthcoming), while others find little difference (e.g. Fleishman, 1988; Cubitt et al., 2011; Cox et al., 2013; Stoddard, 2014; Fosgaard et al., forthcoming). Some studies find the opposite (e.g. Brewer and Kramer, 1986; Brown, 2006).

Fujimoto and Park (2010) find Andreoni's negative frame has a larger effect on cooperation for men than women in a one-shot experiment. Such gender differences might partly explain the mixed results in the literature. While my experiment is not designed specifically to study gender differences, as a secondary point I explore whether the gender differences found by Fujimoto and Park persist over multiple rounds and extend to free-riding behavior.

The results show lower cooperation and higher free-riding in the Taking frame. Loss framing has weaker effects. Moreover, I find that framing effects on cooperation are driven almost entirely by men. Nonetheless, both men and women free-ride more frequently under Taking than under Contributing.

2 Experimental Design and Procedures

Like Andreoni (1995), each session had twenty subjects, randomly and anonymously assigned to groups of five at the beginning of each of ten rounds. Subjects were given aggregate-level feedback on their group members' choices after each round. Subjects were paid for one random round.[1]

Table 1 summarizes the four treatments. In every treatment, each player can transfer 0 to 1000 tokens, worth \$0.01 each. Each token transferred to (from) the group account increases (decreases) the group account balance by 2.5 tokens. Each player receives her final private account balance and receives (pays) an equal share of the positive (negative) group account balance. It is straightforward to verify that the four payoff functions are equivalent.

Nine sessions were run (2 CG, 2 CL, 2 TG, and 3 TL) with 180 total participants. All sessions were run at The Ohio State University using z-Tree (Fischbacher, 2007). Sessions lasted about 45 minutes, and subjects earned about \$15 per person.

	Initial Account Balances (tokens)		
Treatment	Private	Group	Transfers
CG	1000	0	Private to Group
CL	3500	-12500	Private to Group
TG	0	12500	Group to Private
TL	2500	0	Group to Private

Table 1. *Treatment Summary*

[1] Andreoni (1995) payed subjects for all rounds. Azrieli et al. (2014) show that paying for one random round avoids potential confounds such as wealth effects.

	All Subjects	Men	Women
feedback	0.048*	0.028	0.076***
	(0.025)	(0.038)	(0.027)
round	-19.478***	-37.715***	0.923
	(5.025)	(8.680)	(4.078)
TG	-283.694***	-449.165***	-69.905
	(104.001)	(137.998)	(157.242)
CL	-95.364	-69.314	-75.631
	(84.515)	(137.490)	(98.742)
TL	-184.894**	-251.118*	-105.709
	(86.567)	(129.586)	(101.187)
constant	447.605***	679.248***	168.428
	(83.970)	(124.915)	(96.133)

Table 2. *Tobit regressions for cooperation. The omitted treatment indicator is CG. Standard errors clustered by subject in parentheses. ***, **, and * indicate 1%, 5%, and 10% level significance.*

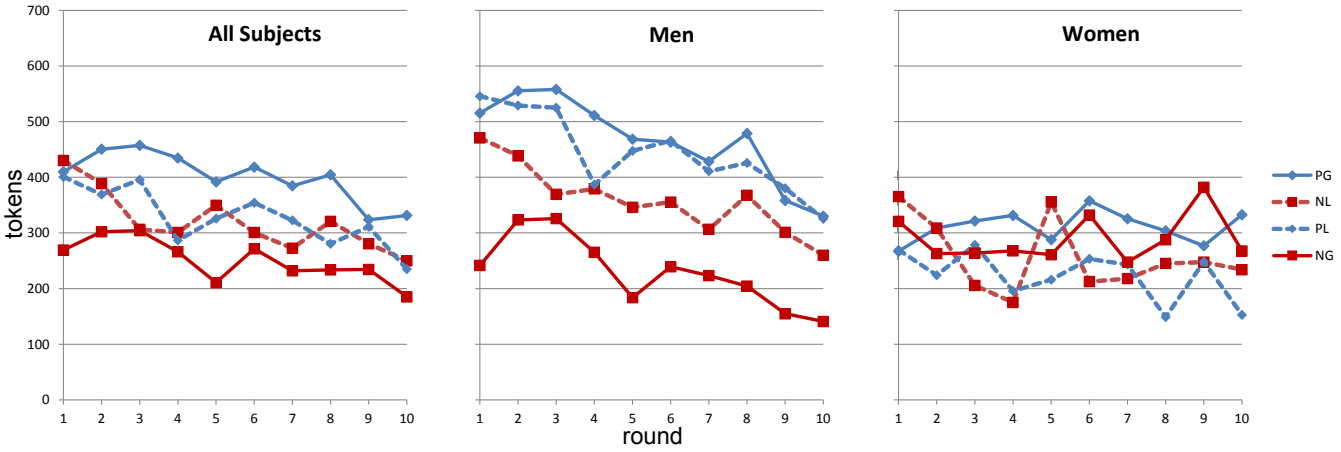

Figure 1. *Average cooperation.*

3 Results

Figure 1 shows average cooperation by round for each treatment for all subjects and seperately by gender.[2] Cooperation is defined as the amount transferred to the group account in Contributing frames (CG and CL) or 1000 minus the amount transferred from the group account in Taking frames (TG and TL). To formally test for treatment differences, I use Tobit regressions reported in Table 2.[3] Cooperation is significantly lower in Taking frames than in Contributing frames for

[2]Overall, 41.7% of subjects in the experiment were women. By treatment, the percentages of women were: 42.5% (CG), 35.0% (TG), 52.5% (CL), and 38.3% (TL).

[3]As subjects are randomly re-matched into groups in each round, feedback may create dependence between individuals in a session (see Fréchette, 2012). As a control for such effects, I include in each regression model a lagged "feedback" variable equal to the aggregate cooperation by others in the previous round. Regressions have also been run including a 2-period lagged feedback variable, and using the average cooperation by other players across all

	All Subjects	Men	Women
feedback	0.9998*	0.9999	0.9997*
	(0.0001)	(0.0001)	(0.0002)
round	1.0813***	1.1401***	0.9885
	(0.0219)	(0.0309)	(0.0285)
TG	6.4134***	6.1626***	6.9790**
	(3.0265)	(3.2888)	(6.3201)
CL	1.6115	2.3334	1.0221
	(0.7535)	(1.2877)	(0.8698)
TL	4.5866***	4.5270***	4.6360*
	(2.0482)	(2.3087)	(3.9821)

Table 3. *Logistic regressions for free-riding. The omitted treatment indicator is CG. Odds ratios shown with standard errors clustered by subject in parentheses. ***, **, and * indicate 1%, 5%, and 10% level significance.*

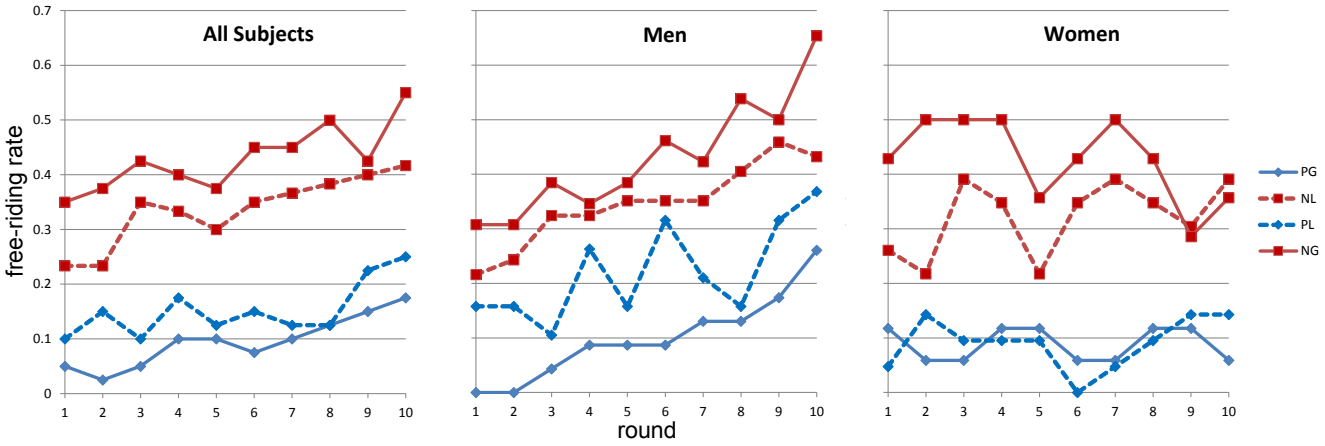

Figure 2. *Free-riding rates.*

Gains. Loss framing does not show such a clear effect. However, examining men and women seperately, the framing effect appears to be driven entirely by men. Furthermore, there appear to be gender differences in dynamics: in all four treatments, men's average cooperation trends downward, while women's cooperation is relatively flat.

Framing also affects free-riding rates. Figure 2 shows free-riding rates by round. Table 3 shows logistic regression results for treatment effects on rates of choosing the free-riding dominant strategy. Take framing increases free-riding for men and women.

4 Discussion

This paper contributes to the previous literature by clearly decomposing the framing effects of Contributing vs. Taking and Gains vs. Losses and showing that the former is more important in

previous rounds, but the results remain similar in both cases. Another approach suggested in Fréchette (2012) is to cluster standard errors at the *session* level. This approach yields similar results.

this environment. The Taking frame reduces average cooperation and increases free-riding. Loss framing has weaker effects.

As a secondary contribution, I show persistent gender differences in framing effects. Take framing has a strong effect on average cooperation for men, but not for women. While it is difficult to explain the underlying causes of such gender differences, one possible conjecture is that Take framing primes competitive norms which are more salient for men. However, Take framing increases free-riding rates for both genders. In all frames, men's cooperation falls over multiple rounds, while women's does not. I am not aware of previous studies finding this result, and it may merit further study in future research.

Gender differences in framing effects might help to explain the mixed results in the previous literature. While differences in procedures, and differing statistical power, or other uncontrolled variables may also lead to differing results, differences in gender composition could be part of the explanation. However, gender is not the focus of my experimental design, and further study is needed to determine whether these gender differences are robust.

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References

Allison, S., Messick, D., 1985. Behaviors or nonbehaviors as the cooperative or defective responses to two types of social dilemmas, Working Paper.

Andreoni, J., 1995. Warm-glow versus cold-prickle: The effects of positive and negative framing on cooperation in experiments. *Quarterly Journal of Economics* 110, 1–21.

Azrieli, Y., Chambers, C. P., Healy, P. J., 2014. Incentives in experiments: A theoretical analysis, Working Paper.

Brandts, J., Schwieren, C., 2009. Frames and economic behavior: An experimental study, Working Paper.

Brewer, M. B., Kramer, R. M., 1986. Choice behavior in social dilemmas: Effects of social identity, group size, and decision framing. *Journal of Personality and Social Psychology* 50, 543–549.

Brown, A. L., 2006. Decision-making in social dilemmas: Positive and negative framing, payoff structure, and affect. Ph.D. thesis, Miami University.

Cox, J. C., Ostrom, E., Sadiraj, V., Walker, J. M., 2013. Provision versus appropriation in symmetric and asymmetric social dilemmas. *Southern Economic Journal* 79, 496–512.

Cubitt, R. P., Drouvelis, M., Gächter, S., 2011. Framing and free riding: emotional responses and punishment in social dilemma games. *Experimental Economics* 14, 254–272.

Dufwenberg, M., Gächter, S., Hennig-Schmidt, H., 2011. The framing of games and the psychology of play. *Games and Economic Behavior* 73, 459–478.

Fischbacher, U., 2007. z-Tree: Zurich toolbox for ready-made economic experiments. *Experimental Economics* 10, 171–178.

Fleishman, J. A., 1988. The effects of decision framing and other's behavior on cooperation in a social dilemma. *Journal of Conflict Resolution* 32, 162–180.

Fosgaard, T., Hansen, L. G., Wengström, E., forthcoming. Understanding the nature of cooperation variability, *Journal of Public Economics*.

Fréchette, G. R., 2012. Session-effects in the laboratory. *Experimental Economics* 15, 485–498.

Fujimoto, H., Park, E., 2010. Framing effects and gender differences in voluntary public goods provision experiments. *Journal of Socio-Economics* 39, 455–457.

Khadjavi, M., Lange, A., forthcoming. Doing good or doing harm: experimental evidence on giving and taking in public good games, *Experimental Economics*.

Park, E., 2000. Warm-glow versus cold-prickle: a further experimental study of framing effects on free-riding. *Journal of Economic Behavior and Organization* 43, 405–421.

Sonnemans, J., Schram, A., Offerman, T., 1998. Public good provision and public bad prevention: the effect of framing. *Journal of Economic Behavior and Organization* 34, 143–161.

Stoddard, B., 2014. Uncertainty in payoff-equivalent appropriation and provision games, Working Paper.